

FISHING LINE AND LURE CONNECTORS

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DEPARTMENT OF COMMERCE

1 FISHING LINE AND LURE CONNECTORS

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4 Field of the Invention

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6 This invention relates to angling accessories and,
7 more particularly, to connectors for securing lines and
8 lures.

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Background of the Invention

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12 A fisherman is no better than his knots. It is no
13 good to own the best tackle and have an abundance of
14 fishing knowledge and skill if, when fish are hooked, knots
15 give way. The angler must therefore pay close attention to
16 his knots. Under most conditions, an angler needs to know
17 how to tie only a few knots, which, for most fishermen,
18 include the clinch knot for fastening lures to leaders and
19 tippets, the blood knot for fastening tippets to leaders
20 and the nail knot for fastening leaders to fly lines. On a
21 windy day, a cold day when hands are cold and for the
22 elderly fisherman who has lost dexterity in his hands,
23 tying knots can prove difficult and frustrating. Although
24 the well-traveled angler typically employs a vast arsenal

1 of gadgets and accessories in practicing his art, needed is
2 yet another to provide the angler with a way to easily
3 fasten lures to leaders and tippets, tippets to leaders and
4 leaders to fly lines.

5

6 Accordingly, it would be highly desirable to provide
7 new and improved connectors for securing lines and lures.

8

9 It is another purpose of the invention to provide new
10 and improved connectors that are easy to use.

11
12 It is still another purpose of the invention to
13 provide new and improved connectors that are easy and
14 inexpensive to construct.

15
16 It is a further provision of the invention to
17 eliminate the need and difficulty of tying attachment
18 knots.

19

20 It is still a further purpose of the invention to
21 provide new and improved connectors that are strong, easy
22 to install and transport, and highly efficient.

1 It is yet still a further purpose of the invention to
2 increase the ease and efficiency of exchanging lures during
3 fishing activity.

1 Summary of the Invention

2

3 The above problems and others are at least partially
4 solved and the above purposes and others realized in new
5 and improved connectors for securing lines and lures. In
6 one embodiment, provided is a connector for receiving and
7 securing an end segment of a line. The end segment defines
8 an outer diameter. The connector is comprised of a
9 receptacle including a chamber bound by a substantially
10 continuous sidewall defining an inner diameter that is
11 substantially equal to the outer diameter of the end
12 segment of the line. The connector supports extensions or
13 teeth which extend into the chamber for impinging against
14 the end segment. The receptacle is resilient and
15 deformable, and the extensions are positioned at spaced
16 intervals along substantially the entire length of the
17 chamber. The extensions are directed away from an open end
18 of the receptacle which leads to the chamber for providing
19 a maximum engagement. The receptacle supports a coupler or
20 line, which are each capable of engaging and supporting a
21 lure. In accordance with another embodiment of the
22 invention, receptacle may be supported by or formed at or
23 into at least one of the opposing ends of a length of line,
24 such as the butt end of a leader.

1 In another embodiment of the invention, provided is a
2 connector for coupling a first end segment of a first line
3 and a second end segment of a second line. The first and
4 second end segments each define an outer diameter. In this
5 embodiment, the connector is comprised of a body including
6 a first receptacle for receiving and securing one of the
7 first and second end segments and an opposing receptacle
8 for receiving and securing the other of the first and
9 second end segments. The first receptacle includes a first
0 chamber bound by a substantially continuous sidewall
1 defining an inner diameter that is substantially equal to
2 the outer diameter of the one of the first and second end
3 segments. The first receptacle supports first extensions
4 or teeth which extend into the first chamber for impinging
5 against the one of the first and second end segments. The
6 second receptacle includes a second chamber bound by a
7 substantially continuous sidewall defining an inner
8 diameter that is substantially equal to the outer diameter
9 of the other of the first and second end segments. The
0 second receptacle supports second extensions or teeth which
1 extend into the second chamber for impinging against the
2 other of the first and second end segments. The body is
3 resilient and deformable. The first chamber includes a
4 length, and the first extensions extend into the first

1 chamber at spaced intervals along substantially the entire
2 length of the first chamber, and are directed away from an
3 opening leading to the first chamber. The second chamber
4 also includes a length, and the second extensions extend
5 into the second chamber at spaced intervals along
6 substantially the entire length of the second chamber, and
7 are directed away from an opening leading to the second
8 chamber.

9

10 In accordance with yet another embodiment, provided is
11 a connector for receiving and securing an end segment of a
12 line. The end segment includes an outer diameter and the
13 connector is comprised of a receptacle including a chamber
14 bound by a substantially continuous sidewall defining an
15 inner diameter. The connector is resilient and deformable
16 between shortened and lengthened conditions. The connector
17 is constructed and arranged such that the inner diameter is
18 maximized in the shortened condition and minimized in the
19 lengthened condition. The receptacle supports a biasing
20 element or framework which biases the receptacle into the
21 lengthened condition. The biasing element also which
22 facilitates the minimum and maximum inner diameters of the
23 receptacle when the connector is moved into and between the
24 shortened and lengthened conditions. The inner diameter of

1 the receptacle in the shortened condition is greater than
2 the outer diameter of the end segment, and the inner
3 diameter of the receptacle in the lengthened condition is
4 less than or at least substantially equal to the outer
5 diameter of the end segment. The receptacle of this
6 embodiment may be provided with extensions or teeth
7 extending into the chamber for impinging against the end
8 segment. If provided, the extensions should preferably
9 extend into the chamber at spaced intervals along
10 substantially the entire length of the chamber, and point
11 away from an opening of the receptacle leading to the
12 chamber. The receptacle supports a coupler or line which
13 are each capable of engaging and supporting a lure. In
14 accordance with the invention, the receptacle may be
15 supported by or formed at or into at least one of the
16 opposing ends of a length of line, such as the butt end of
17 a leader.

18

19 In accordance with yet another embodiment of the
20 invention, provided is a coupler for coupling a first end
21 segment of a first line and a second end segment of a
22 second line. The first and second end segments each have
23 an outer diameter. In this embodiment, the coupler is
24 comprised of a body including a first receptacle for ..

1 receiving and securing one of the first and second end
2 segments and an opposing receptacle for receiving and
3 securing the other of the first and second end segments.
4 The first receptacle includes a first chamber bound by a
5 substantially continuous sidewall which defines an inner
6 diameter. The first receptacle is resilient and deformable
7 between shortened and lengthened conditions. The body is
8 constructed and arranged such that the inner diameter is
9 maximized in the shortened condition and minimized in the
10 lengthened condition. The first receptacle supports a
11 first biasing element or framework for biasing the first
12 receptacle into the lengthened condition. The first
13 biasing element also facilitates the minimum and maximum
14 inner diameters of the first receptacle when the first
15 receptacle is moved into and between the shortened and
16 lengthened conditions. The inner diameter of the first
17 receptacle in the shortened condition is greater than the
18 outer diameter of the one of the first and second end
19 segments, and the inner diameter of the first receptacle in
20 the lengthened condition is less than or at least
21 substantially equal to the outer diameter of the one of the
22 first and second end segments. The second receptacle
23 includes a second chamber bound by a substantially
24 continuous sidewall defining an inner diameter that is

1 substantially equal to the outer diameter of the other of
2 the first and second end segments. The second receptacle
3 deformable between shortened and lengthened conditions.
4 The body is constructed and arranged such that the inner
5 diameter of the second receptacle is maximized in the
6 shortened condition and minimized in the lengthened
7 condition. The second receptacle supports a second biasing
8 element or framework for biasing the second receptacle into
9 the lengthened condition. The second biasing element also
10 facilitates the minimum and maximum inner diameters of the
11 second receptacle when the second receptacle is moved into
12 and between the shortened and lengthened conditions. The
13 inner diameter of the second receptacle in the shortened
14 condition is greater than the outer diameter of the other
15 of the first and second end segments, and the inner
16 diameter of the second receptacle in the lengthened
17 condition is less than or at least substantially equal to
18 the outer diameter of the other of the first and second end
19 segments.

20

21 The first and second biasing elements are preferably
22 integrally formed with the first and second receptacles,
23 respectively. The first receptacle may be equipped with
24 first extensions or teeth extending into the first chamber

1 for impinging against the one of the first and second end
2 segments. If provided, the first extensions or teeth
3 preferably extend into the first chamber at spaced
4 intervals along substantially the entire length of the
5 first chamber and away from an opening leading to the first
6 chamber. The second receptacle may be equipped with second
7 extensions or teeth extending into the second chamber for
8 impinging against the other of the first and second end
9 segments. If provided, the second extensions or teeth
10 preferably extend into the second chamber at spaced
11 intervals along substantially the entire length of the
12 second chamber and away from an opening leading to the
13 second chamber.

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1 BRIEF DESCRIPTION OF THE DRAWINGS

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3 The foregoing and further and more specific objects
4 and advantages of the invention will become readily
5 apparent to those skilled in the art from the following
6 detailed description taken in conjunction with the drawings
7 in which:

8

9 Fig. 1 illustrates a connector coupling a lure to a
10 line, the connector being shown as it would appear in use
11 by an angler;

12

13 Fig. 2 is an enlarged perspective view of the
14 connector of Fig. 1;

15

16 Fig. 3 is a sectional view taken along line 3-3 of
17 Fig. 2;

18

19 Fig. 3A is a view very similar to the view of Fig. 3,
20 with the connector shown as it would appear securing a
21 line;

22

23 Fig. 4 is a front view of the connector of Fig. 2;

1 Fig. 5 is a perspective view of another embodiment of
2 a connector for coupling a lure to a line;

3

4 Fig. 5A is a sectional view taken along line 5A-5A of
5 Fig. 5;

6

7 Fig. 6 is a front view of the connector of Fig. 5;

8

9 Fig. 7 is a perspective view of yet another embodiment
0 of a connector for coupling a lure to a line;

1

2 Fig. 8 is a sectional view taken along line 8-8 of
3 Fig. 7;

4

5 Fig. 9 is a perspective view of a length of line
6 constructed in accordance with the invention;

17

18 Fig. 10 is a sectional view taken along line 10-10 of
19 Fig. 9;

20

21 Fig. 11 is a perspective view of a connector for
22 securing two lines;

1 Fig. 12 is a sectional view taken along line 12-12 of
2 Fig. 11;

3

4 Fig. 12A is a view very similar to the view of Fig.
5 12, with the connector shown as it would appear securing
6 two lines;

7

8 Fig. 13 is a perspective view of yet still another
9 embodiment of a connector for connecting a lure to a line;

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11 Fig. 14 is a sectional view taken along line 14-14 of
12 Fig. 13;

13
14 Fig. 15 is a view very similar to the view of Fig. 14,
15 with the connector as it would appear receiving a line; and

16
17 Fig. 16 is a view very similar to the view of Fig. 15,
18 with the connector shown as it would appear securing a
19 line.

1 DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

2

3 Turning to the drawings, in which like reference
4 characters indicate corresponding elements throughout the
5 several views, attention is first directed to Fig. 1, which
6 illustrates a connector 20 for coupling a lure 21 to a line
7 22 (shown in phantom line). Connector 20 is shown in Fig.
8 1 being employed by an angler 23 shown in phantom outline.

9 Regarding Fig. 2, connector 20 is constructed of or formed
10 from nylon or other similarly resilient, strong and
11 deformable material, and is comprised of a receptacle 25
12 and a coupler 26. Turning to Fig. 3, receptacle 25 is
13 elongate and includes a continuous sidewall 30 having
14 opposing ends 31 and 32. End 32 is open and leads to a
15 chamber 33 bound by sidewall 30. End 31 is preferably
16 closed, but it may be open if so desired so as to
17 communicate with chamber 33. Chamber 33 is elongate and
18 defined by a continuous inner surface 34 of sidewall 30.
19 Surface 34 defines an inner diameter D of chamber 33 that
20 is substantially constant along substantially the entire
21 length of chamber 33 from end 32 to end 31. Protrusions,
22 extensions or teeth 35 extend into chamber 33 from inner
23 surface 34 and are positioned at spaced intervals along
24 substantially the entire length of chamber 33 from end 32

1 to end 31. Teeth 35 are flexible and resilient, preferably
2 molded, formed or integral with sidewall 30, and face away
3 from end 32.

4

5 Regarding Fig. 3A, receptacle 25 is designed to
6 receive and secure an end segment 41A of a line 41. In
7 this example, line 41 is a fishing line such as a tippet or
8 leader formed of nylon monofilament, and end segment 41A is
9 a length of line 41 leading to its free end 41B. Inner
10 diameter D of chamber 33 is substantially equal to the
11 outer diameter of end segment 41A. To install connector
12 20, connector 20 is held and end 41B forced into chamber 33
13 through end 32. Because teeth 35 are slanted or directed
14 away from open end 32, flexible and resilient, chamber 33
15 readily accepts end segment 41A without considerable effort
16 or difficulty. When installed in chamber 33, it is
17 preferred that free end 41B reside against or immediately
18 adjacent end 31 of receptacle 25.

19

20 Because inner diameter D of chamber is substantially
21 constant from end 32 to end 31 of receptacle 25 and
22 substantially equal to the outer diameter of end segment
23 41B, the fit of end segment 41A against inner surface 34 of
24 chamber 33 is tight, snug or close. This forces teeth 35

1 to impinge against end segment 41A. In Fig. 3A, an
2 exaggerated space is shown between end segment 41A and
3 inner surface 34 of chamber 33 for ease of illustration.
4 The slanted orientation of teeth 35 away from end 32, the
5 snug fit of end segment 41A in chamber 33 and the
6 impingement of teeth 35 against end segment 41A cooperate
7 to grippingly seize or secure end segment 41A in place, and
8 inhibits end segment 41A from dislodging from chamber 33
9 through open end 32 while under a pulling force. Although
10 teeth 35 are flexible and resilient, the snug fit between
11 inner surface 34 and end segment 41A prevents teeth 35 from
12 buckling under force and compels them to impinge against
13 end segment 41A, which provides a surprisingly strong and
14 highly effective coupling.

15

16

Most fisherman use fishing lines with outer diameters
that range from 0.004 to 0.021 of an inch. Smaller and
larger sizes can, however, be found. Depending on the
needs of the angler and the fishing line he is using,
receptacle 25 is preferably from 0.5-8.0 cm in length and
1-10 mm in outer diameter, with the thickness of sidewall
30 falling from 0.5-4.0 mm. However, receptacle 25 may
incorporate any suitable or desired dimensions consistent
with the teachings of this disclosure.

With regard to Figs. 2 and 3, coupler 26 is supported by and extends away from end 31 of receptacle 25, and is designed to engage the hook eye of a lure, obviating the need to tie a clinch knot, a Turle knot, a Homer Rhode loop knot, end-loop knot or other suitable lure-to-line connection knot. In this embodiment, coupler 26 is comprised of a pair of resilient hooks 40 and 41, which extend away from end 31 and engage one another in an overlapping state (see Fig. 4) forming a continuous loop. Hooks 40 and 41 are substantially coextensive, biased together, and may made of the same material as receptacle 25 or a different material. A lure is engagable to coupler 26 by forcing hooks 40 and 41 apart and threading the free end of one of the hooks 40 and 41 into and through the hook eye of the lure. The engagement of hooks 40 and 41 in the overlapping state prevents the attached lure from falling off. Hooks 40 and 41 are constructed of a size that will permit the overlapping portions to readily pass through the hook eye of the lure. To remove the lure, the foregoing operation need only be reversed.

21

The coupler of the invention may be provided in many forms suitable for permitting engagement to the hook eye of a lure. As a matter of example Figs. 5, 5A and 6

1 illustrate another embodiment of a connector 45, which is
2 comprised of a receptacle 46 and another embodiment of a
3 coupler 47. Receptacle 46 incorporates the same structural
4 features as receptacle 25. Accordingly, details of
5 receptacle 46 will not be discussed. Coupler 47 is
6 comprised of a pair of resilient plates 48 and 49, which
7 extend away from the closed end of receptacle 46 in an
8 overlapping state. Plates 48 and 49 are substantially
9 coextensive, biased together and made of the same material
D10 as receptacle 46. Plate 48 carries a prong 50, which
S11 resides between a pair of prongs 51A and 51B carried by
F12 plate 49. Prongs 50, 51A and 51B cooperate together to
C13 hold or clutch the hook eye of a lure when it is slipped
D14 between plates 48 and 49. To facilitate easy insertion of
F15 the hook eye between plates 48 and 49, prongs 50, 51A and
P16 51B are outwardly beveled. To remove the lure, a user need
D17 only grasp lure, twist it to forcefully separate plates 48
18 and 49 and then move the lure away.

19

20 Turning now to Figs. 7 and 8, shown is a connector 54
21 constructed in accordance with yet another embodiment of
22 the invention. Connector 54 is comprised of a receptacle
23 55 and a line 56. Receptacle 54 incorporates the same
24 structural features as receptacle 25 discussed previously.

1 Accordingly, details of receptacle 54 will not be
2 discussed. Line 56 is formed with and extends from end 57
3 of receptacle 54. In this embodiment, end 57 is closed.
4 It is intended that line 57 comprise tippet of a specified
5 length and having a free end available for tying to a lure
6 in a conventional manner. In this embodiment, receptacle
7 54 is designed to engage the end of a leader, obviating the
8 need to tie a blood knot or other suitable line-to-line
9 connection knot.

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10
11 Regarding Figs. 9 and 10, shown is a length of line 60
12 constructed in accordance with the invention. Line 60 is
13 elongate, includes opposing ends 61 and 62, and is
14 constructed or formed of a resilient, strong and deformable
15 material such as nylon or other suitable material. In this
16 embodiment, line 60 is shown in the form of a tapered
17 leader, with end 61 comprising the butt end and end 62
18 comprising the tail end. Line 60 can comprise a level
19 leader if so desired. Formed into end end 61 is a
20 receptacle 63, which incorporates the same structural
21 features as receptacle 25. Accordingly, details of
22 receptacle 63 will not be discussed. In this embodiment,
23 line 60 is designed to function as the nearly invisible
24 connection between a lure and, for instance, a fly line or

1 other form of fishing line. Receptacle 63 secures an end
2 segment of the fly line, which obviates the need to tie a
3 nail knot or other suitable leader-to-fly line connection
4 knot.

5

6 Attention is now directed to Figs. 11, 12 and 12A,
7 which illustrate a connector 70 for securing two lines such
8 as a fly line and a leader or a leader and tippet, and for
9 securing together monofilament of different diameters. In
10 this embodiment, connector 70 is comprised of an elongate
11 body or sleeve 71 having opposing receptacles 72 and 73 on
12 either side of sleeve 71. Receptacles 72 and 73 each
13 incorporate the same structural features as receptacle 25.
14 Accordingly, details of receptacles 72 and 73 will not be
15 discussed. However, in this embodiment the closed ends of
16 receptacles 72 and 73 face one another and the open ends of
17 receptacles 72 and 73 face away from one another. The axes
18 defined by receptacles 72 and 73 are substantially common
19 as clearly shown in Figs. 12 and 12A. Figure 12 shows two
20 lines 74 and 75 each shown as they would appear secured to
21 receptacles 72 and 73, respectively. The diameters of
22 receptacles 72 and 73 may be substantially the same for
23 facilitating a coupling between lines having substantially
24 identical diameters, or different for facilitating a

1 coupling between lines having different diameters. Body 71
2 is preferably molded or otherwise integrally formed of a
3 resilient, strong and deformable material such as nylon or
4 other suitable material, and obviates the need for an
5 angler to tie a blood knot, surgeon's knot, shocker knot or
6 other suitable line-to-line connection knot.

7

8 Turning now to Figs. 13-16, illustrated is still
9 another embodiment of a connector 80 for connecting a lure
10 to a line. Connector 80 is constructed of or formed from
11 nylon or other similarly resilient, strong and deformable
12 material, and is comprised of a receptacle 81 and a coupler
13 82. As best shown in Fig. 14, receptacle 81 is elongate
14 and includes a continuous sidewall 83 having opposing ends
15 84 and 85. End 85 is open and leads to a chamber 86 bound
16 by sidewall 83. End 84 is preferably closed, but it may be
17 open if so desired. Chamber 86 is elongate and defined by
18 a continuous inner surface 87 of sidewall 83. Surface 87
19 defines an inner diameter D' of chamber 86 that is
20 substantially constant along substantially the entire
21 length of chamber 86 from end 85 to end 84. Although not
22 shown, protrusions, extensions or teeth may be provided to
23 extend into chamber 86 from inner surface 87 at spaced
24 intervals along substantially the entire length of the

1 chamber 86 from end 85 to end 84. If provided, these teeth
2 35 are preferably flexible and resilient, molded, formed or
3 integral with sidewall 83, and face away from end 85.
4 Coupler 82 may comprise the structure of coupler 26
5 discussed previously in connection with connector 20 or
6 coupler 47 discussed previously in connection with
7 connector 45. In lieu of coupler 82, a line may be used,
8 much like line 56 discussed previously in connection with
9 coupler 54.

10

11 Receptacle 81 is deformable between a shortened
12 condition shown in Fig. 15 and a lengthened condition shown
13 in Figs. 13, 14 and 15. Receptacle 81 supports or is
14 otherwise equipped with a biasing element or framework 92,
15 which is constructed and arranged for biasing receptacle 81
16 into the lengthened condition and for resisting the
17 movement of receptacle 81 into the shortened condition.
18 Biasing element 92 may comprise a discrete device that
19 fastened or otherwise coupled to receptacle 81 or, in
20 regards to a preferred embodiment, formed or molded
21 integral with receptacle 81 as substantially shown. In
22 this embodiment, biasing element 92 is comprised of a
23 spring 93, which has the form of a coiled element or
24 framework much like a conventional compression spring.

1 However, biasing element 92 may comprise ribbing or other
2 framework construction suitable for biasing receptacle 81
3 into the lengthened condition. Due to the resiliency and
4 deformability of receptacle 81, spring 93 is constructed
5 and arranged in such a way that it causes inner diameter D'
6 of receptacle 81 to increase or maximize in the shortened
7 condition of receptacle 81 and decrease or minimize in the
8 lengthened condition of receptacle 81. Consistent with
9 this disclosure, biasing element 92 may be provided as a
10 framework of any appropriate structure capable of carrying
11 the same function as spring 93.

12

13 Receptacle 81 is designed to receive and secure an end
14 segment 90A of a line 90. In this example, line 90 is a
15 fishing line such as a tippet or leader formed of nylon
16 monofilament, and end segment 90A is a length of line 90
17 leading to its free end 90B. When receptacle 81 is in the
18 lengthened condition, inner diameter D' of chamber 86 is
19 less than or at least substantially equal to the outer
20 diameter of end segment 90A. When receptacle 81 is in the
21 shortened condition, inner diameter D' of chamber 86 is
22 greater than the outer diameter of end segment 90A.

1 To install connector 80, connector 80 is held and end
2 90B forced into chamber 86 from end 85. The bias of spring
3 93 may be overcome in response to a sufficient force
4 exerted in the act of forcing end 90B of line 90 into and
5 through end 85. This causes receptacle 81 to move into the
6 shortened condition, which increases inner diameter D' and
7 allows end 90B to pass into chamber 86 through end 85 as
8 shown substantially in Fig. 15. When end segment 90A is
9 properly inserted into chamber 86, spring 93 biases
10 receptacle 81 into the extended condition as shown
11 substantially in Fig. 16, which causes inner diameter D' to
12 decrease or otherwise move into or near its minimized
13 condition which causes inner surface 87 to frictionally
14 grip, seize or clutch end segment 90A. This frictional
15 seizing of end segment 90A is sufficient to provide a
16 strong, efficient coupling between receptacle 81 and line
17 90, which inhibits end segment 90A from dislodging from
18 chamber 86 through end 85 while under a pulling force.
19 When end segment 91A is installed into chamber 86 in this
20 manner, it is preferred that end 90B reside against or
21 immediately adjacent end 84 of receptacle 81. To enhance
22 the coupling between receptacle and end segment 90A, inner
23 surface 87 be textured as generally shown in Fig. 14 or
24 provided with teeth as discussed above.

1 In view of this disclosure, the skilled artisan will
2 readily appreciate that receptacle 81 may be formed at or
3 into the butt end of a leader much like leader 60
4 previously discussed in combination with Figs. 9 and 10,
5 and that two receptacles 81 may be formed into a connector
6 for connecting two lines together like connector 70
7 previously discussed in combination with Figs. 11, 12, and
8 12A. Also, each connector discussed in this specification
9 may be rated or otherwise constructed to withstand the same
10 pressure or pounds as a corresponding fishing line so as to
11 give only when the corresponding fishing line itself would
12 have given. When a coupler or an attached line breaks, the
13 angler need only clip the line to form a clean free end and
14 then attach a desired coupler consistent with the teachings
15 of this disclosure.

16

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17 The invention has been described above with reference
18 to one or more preferred embodiments. However, those
19 skilled in the art will recognize that changes and
20 modifications may be made in the described embodiments
21 without departing from the nature and scope of the
22 invention. Various changes and modifications to one or
23 more of the embodiments herein chosen for purposes of
24 illustration will readily occur to those skilled in the

1 art. To the extent that such modifications and variations
2 do not depart from the spirit of the invention, they are
3 intended to be included within the scope thereof, which is
4 assessed only by a fair interpretation of the following
5 claims.

6

Having fully described the invention in such clear and concise terms as to enable those skilled in the art to understand and practice the same, the invention claimed is:

□ 9 15 10 11 12 13 14 15